Growth Process and Growth Stuctures in Open Spaces

Overview

Development of ordered structures proceeds in 4 ways:

1. *Sublimation*--deposition from vapour. e.g. sulphur in volcanic rocks.
2. *Precipitation from solution*--deposition under conditions of supersaturation by such processes as evaporation, decrease in temperature, reaction with wallrock, etc.
3. *Crystallization from a melt*--i.e. from silicate magmas (chromite, magnetite) or sulphide magmas (MSS)
4. *Solid-solid transformations*--development of crystalline solid from amorphous material,crystalline inversions.

Crystallization decreases the free energy of a system, but residual energy at the surface remains and is called surface energy in crystals exposed to solutions, or interfacial energy in the case of crystal aggregates.

Reduction in surface energy is accomplished by:

1. reducing total surface area, and
2. reducing the area of particular surface characterized by high free energies.

Only (1.) above is important in isotropic crystals but both (1.) and (2.) are important in anisotropic crystals.

Shape controls unsatisfied charges as illustrated in Fig. III-5. The **A** configuration has fewer unsatisfied surface charges than **B**; consequently, **A** has a lower surface energy and is more stable. This simple presentation assumes equal probabilaity of crystal growth in all directions. In the case of open space filling this is not necessarily so as one part of the crystal is attached to a growth surface.

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Table I-1
Some Applications of Mineralographic Methods to the Study of Mineral Deposits

Practical	Academic	Material Studied
1. Cheap, fast, routine mineral identification. 2. Preliminary to XRD analysis. 3. Mission oriented mineralogical studies • mill products • zoning studies 4. Textural studies • milling • deformation of ores • origin of ore deposits 5. Mass balance studies -- point counting	1. Paragenesis of ores 2. Reaction products in high T-P synthesis and experiments 3. Exsolution studies 4. Fluid inclusion studies--of transparent materials	1. Ores and minerals 2. Mill products 3. Stags 4. Heavy mineral concentrates--sediments, soils, rocks 5. Rocks containing opaque minerals 6. Ceramics 7. Products of experiments 8. Slabs for fluid inclusions examination